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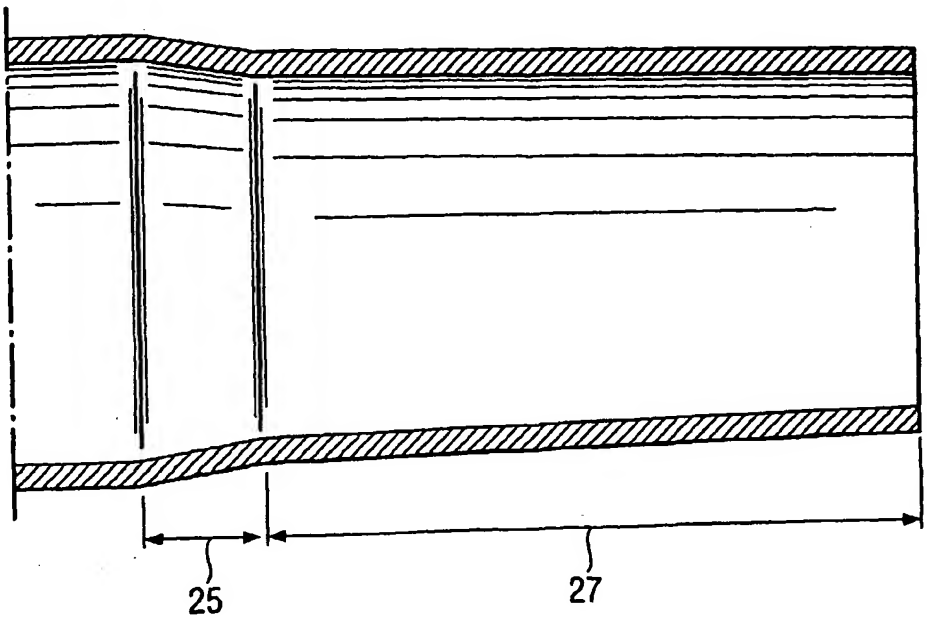
(54) Title: CLEANING IMPLEMENT



(57) Abstract: The present invention relates to a mop (20), preferably suitable for use with a removable cleaning substrate (44), comprising a mop head (22) and a handle (32) consisting of several interconnectable segment (34, 35, 36), said segment comprising one tapered end which is suitable for engagement with the non-tapered end of another segment, characterized in that the tapered end also comprises a first and second section (25, 27).

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Cleaning Implement

Technical Field

The present invention relates to a cleaning implement. Said cleaning implement generally consists of a mop head and a handle. The mop head may be a system for wet or dry cleaning.

Background

Cleaning implements comprising a mop head and handle have been available for some time. Traditional wet mops consisted of a handle and mop head, where the mop head is moistened with cleaning composition and then used to scrub hard surfaces, for example wooden or tiled floors. Carpet sweepers have equally been available for some time. Carpet sweepers generally consist of a handle and sweeper mop head which uses the sweeping action to brush carpet soils into the sweeper head for later collection and disposal. Lately a new cleaning implement has been developed which may be used for dry or wet cleaning or both. This system consists of a mop head in the form of a pad to which is attached a sheet. The sheet may be dry, wet or wettable depending on the system used or the desired use. Examples of such implements are Procter & Gamble's Swiffer™, the dry mop or Procter & Gambles Wetjet™, the wet mop.

The most recent trend has been for these cleaning implements to be made available to the consumer with segmented handles which are designed to be assembled by the user to form the handle. Providing the mop in this way permits the mop to be sold in a box. This provides two advantages, the first being relevant to cost of packing and transport of the mops and the second being relevant to the convenience of the consumer in transporting the mop to their home.

The most common mechanism for assembling the handle is by screwing one segment into another. An example of this system is described in the Applicant's co- pending United States patent application number 09/821953. It has however been found by the Applicant that the handle designed in this way is suitable for dry dusting for example but shows signs of weakness when used for wet cleaning, especially at the joints between the segments of handle. Another mechanism used is the tapering of one end of each segment, said segment is then pushed into the non-tapered end of another segment. This mechanism whilst providing improved strength versus the screw-together mechanism, are easily disassembled. For example catching the mop head on a

table leg and pulling will provide enough force to pull the handle segments apart. It is our understanding that in the opinion of the consumer, this problem is more unacceptable than the problem of weakness.

It has therefore been the objective of the Applicant to design a mop handle which is stronger than those previously available, and which is not easily disassembled.

Summary of the Invention

According to the present invention there is provided a mop, preferably suitable for use with a removable cleaning substrate, comprising a mop head and a handle, said handle comprises at least two interconnectable segments, the first segment comprising a tapered end which is suitable for engagement with the non-tapered end of a second segment, characterized in that the tapered end comprises a first and second section of tapering, said first section comprising tapering of greater angle than said second section.

Detailed Description of the Invention

The present invention is further explained with the help of Figures 1 to 12, wherein:

Figure 1 is a perspective view of a mop according to the present invention;

Figure 2 is a perspective view of a mop according to the present invention, wherein a cleaning sheet is shown disposed about the mop head;

Figure 3 is a cross sectional side view of the floor mop of Fig. 1, taken along line 3-3 thereof, wherein the upper portion of the universal joint and the entire handle have been omitted for clarity;

Figure 4 is an enlarged cross-sectional side view of the elastic pad of the floor mop of Fig. 3;

Figure 5 is an enlarged partial cross-sectional side view of the preferred elastic pad, wherein the radius of curvature is illustrated;

Figure 6 is a cross-sectional side view of another preferred elastic pad for the floor mop of Fig. 1 made in accordance with the present invention, wherein the bottom surface of the elastic pad has a stepped profile;

Figure 7 is a partial cross-sectional side view of an elastic pad, cleaning sheet, and stepped insert made in accordance with the present invention;

Figure 8 is a perspective view of the handle according to the present invention;

Figure 9 is cross-sectional view of a segment comprising the single tapered joint of the prior art;

Figure 10 is a cross-sectional view of a segment according to the present invention;
Figure 11 is a cross-sectional view of the overlapped area of two interconnected segments; and
Figure 12 is a graph depicting the bending profiles.

The present invention is directed to a mop, preferably a mop suitable for use with a removable cleaning sheet, which is attached to a mop head. Said mop head may be for example, a standard cloth mop made of a plurality of strands of fabric or an embodiment comprising a resilient bottom surface, a portion of which preferably has a substantially smooth curved profile or crown which is designed to engage a removable cleaning sheet. While the present invention is discussed herein with respect to a floor mop for purposes of simplicity and clarity, it will be understood that the present invention can be used with other types of mops and cleaning implements.

The mop comprises a handle 32 comprising at least two segments 34, 35, 36, more preferably the mop handle comprises a plurality of segments that can be connected together to make a mop handle 32 which is then attached to a mop head 22. The segments comprise a tapered end and/or a non-tapered end. Segments found in the middle of the handle 36 preferably comprise a tapered and non-tapered end. Segments used to attach the handle to the mop head 34 or comprising the hand grip 35 comprise at least a tapered or non-tapered end so as to interconnect with the segments in the middle of the handle 36. The other end of the segments used to attach the handle to the mop head 34 may comprise a tapered or non-tapered end or another suitable interconnection mechanism. Preferably the interconnection system is selected from the tapered/non-tapered mechanism of the present invention. However in an alternative embodiment the interconnection mechanism involves a threaded screw joint.

The segments should at least with regards to the non-tapered end, be hollow. More preferably the whole segment is hollow. The exterior surface of the tapered end of one segment is designed to engage with the interior surface of the non-tapered end of another segment. The segments can then be pieced together to form the handle.

The segment 34 may be attached to the mop head using any suitable joint as discussed above. More preferably the segment 34 is attached to the mop head 22 at a pivotal, universal joint 30. The cooperating parts of the universal pivotal joint 30 can be found at the end of the segment and on the mop-head. In the embodiment shown in diagram 1 and 2 the universal joint 30 comprises an elongated section to which the final segment of the handle 34 is attached. It is however

envisaged that the final segment 34 may be attached at closer proximity to the universal joint or alternatively the end of the segment 34 may form one part of the universal joint 30.

The tapered area at the end of the segments is tapered in two places. The first section 25 comprises tapering of greater angle than the second section of tapering 27. By this it is meant that the angle of the first section of tapering 25 is steeper than that of the second section 27. The second section 27 is preferably that which is closest to the end of the segment, whereas the first section of tapering 25 is that located between the untapered area of segment and the second tapered section 27. The first section of tapering 25 preferably tapers at an angle of 2.0° to 20.0°, more preferably 5.0° to 10.0° and most preferably 7.0° to 9.5°. The second section of tapering 27 preferably tapers at an angle of 0.5° to 5.0°, more preferably 0.5° to 4.0° and most preferably 1.0° to 3.0°.

Preferably the first section of tapering 25 is shorter in length than the second section of tapering 27. As one segment is engaged with a second segment, there is a portion of the segments which overlap 29. Preferably the length of segment that is overlapped 29 is between 0.5 and 5.0 times the diameter of the non-tapered end. More preferably the length of segment that is overlapped 29 is between 1.0 and 2.0 times the diameter of the non-tapered end, most preferably 1.5 times. The transition between the non-tapered area of the segment and the first section of tapering and/or the transition between the first and second sections of tapering may be sharply angled or smoothly curved. Preferably either transition, more preferably both transitions are smoothly curved.

Tapering the segments of the pole in this way improves the interconnection of the segments when assembling the handle of the mop. The segments are easily assembled by simply engaging a tapered end of one segment with a non-tapered end of another segment. The segments, during the assembly process or when all assembled can be gently tapped or pushed into position. Once assembled the segments of the pole are locked into position and are difficult to disassemble. The force required to separate two segments is preferably greater than 10KgF more preferably greater than 20KgF, most preferably greater than 60KgF.

If necessary an additional locking mechanism can be used to securely lock the segments together. An example of such a locking mechanism would be by punch matching holes through the walls of the overlapped segments and insertion of a spring clip or other suitable system.

The data below describes the necessary force to separate two segments made of the same material with the same dimensions, differing only in the way the segments are interconnected. Interconnection joint A is the system used in currently marketed dry mops wherein the segments are screwed together. Interconnection joint B is a system comprising only 1 tapered section. In this system the tapered section is at an angle of approximately 0.5-2°. Interconnection joint C is according to the present invention and comprises a 1st and 2nd tapered section.

In order to simulate the recommended 'tap' method of assembly instructed to consumers on the package, the following method was used to assemble two segments using interconnection joints B and C: two segments of the handle were interconnected, a 5 lb weight was attached to the top of the segments, and the segments and weight were let fall a distance of 15 mm.

The assembled segments are placed into an Inston machine and secured to fixtures on the base and the mobile crosshead. Upwards movement of the crosshead pulls the segments apart and measures the load incurred. The average force required to separate two segments using joint B was 34.25 kgf, whereas the average force required to separate two segments using joint C was 131.81 kgf.

Experiments were also performed to measure the bending strength of the handle. In this experiment bending tests were performed using the flexural module on an Instron machine. Two segments of the handle using joints A, B and C as describe above, were assembled and placed centered across a 250 mm span. A cylindrical crosshead, 10 mm in diameter and oriented perpendicular to the handle, moved downwards against the middle of the joint, measuring flex up to a load of 45kgf. Less displacement under greater load is indicative of a stronger joint design. The results are represented graphically in Figure 12. All trend lines shown in the figure 12 are second order curves with a zero intercept interpolating data from pools of at least five replicates.

The segments may be made from any suitable material. Preferably the segments are made from suitable metal, plastic, graphite, fiberglass and mixtures thereof. Most preferably the segments are made from metal, most preferably aluminum or steel or mixtures thereof. The cross section of the segments may be of any suitable shape. More preferably the cross section of the segments is selected from the group consisting of circular, oval, curvilinear, star, flower, polygonal, shapes wherein at least one edge is flat or substantially flat and mixtures thereof. Most preferably the shape of the cross section of the segments is selected from circular, oval, curvilinear and mixtures thereof.

The process used to obtain the tapered structures is known as swaging. Any suitable swaging machine may be used for this purpose. The machine tapers the segments, by gripping the segment loosely in place with a vice in the machine. Hydraulic cylinders positioned opposite each longitudinal length of the segment simultaneously press lubricated tools over each length of the tubing. The extent of the pressing action is set in advance depending on the tapering requirement. Different attachments can be used to create different swaging effects. Further details regarding swaging can be provided by any manufacturer of swaging machinery.

In a preferred embodiment, the interior surface of the hollow non-tapered end is shaped to correspond to the shape of the exterior tapered surface of the tapered end.

In one embodiment, exemplified in Figs. 1 and 2 a mop 20 made in accordance with the present invention is illustrated. The floor mop 20 comprises a mop head 22 having a leading edge 24 and a trailing edge 26 (Fig. 3). As used herein, the term "leading edge" is intended to refer to the furthest edge of the mop head 22 which leads the mop head 22 when it is moved in a forward direction away from its user. Likewise, the term "trailing edge" is intended to refer to the furthest edge of the mop head 22 which trails the mop head 22 when it is moved in a forward direction away from its user. For most floor mops, the leading edge 24 and the trailing edge 26 are substantially parallel to the longitudinal axis 28 of the mop head 22, as shown in Fig. 1, wherein the longitudinal axis 28 is the axis along the length of the mop head 22.

In a preferred embodiment, a pivotable joint, such as the universal joint 30, interconnects the handle 32 of the mop 20 with the mop head 22. The universal joint 30 comprises two rotational axes which allow the handle 32 to pivot in directions 37 and 38. The handle 32 is interconnected, preferably threadedly interconnected, with the universal joint 30 at the connection 40. The handle segments are provided in the disassembled condition, so that the floor mop 20 can be shipped within a carton of convenient size and later assembled for use. The handle segment 38 can be provided with a hand grip composed of an elastic and resilient portion suitable for gripping by a user of the floor mop 20. The mop head 22 preferably comprises a plurality of cleaning sheet or substrate attachment structures 42. The attachment structures 42 are configured to receive and retain a cleaning sheet 44 about the mop head 22, as shown in Fig. 2, during use. The attachment structures are preferably slitted and resilient, such that the user can push part of the disposable sheet into the structure. The resilient slitted attachment structures are then capable of reforming their original shape and gripping the disposable sheet. The attachment structures 42 are

preferably disposed at the corners of the mop head 22, although these locations can be varied depending upon the size and shape of the mop head 22. The attachment structures 42 are preferably provided in the form described in copending US application no. 09/364,714, filed August 13, 1999, naming Kingry et al. as joint inventors, the substance of which is hereby fully incorporated herein by reference. The floor mop 20 is preferably used in combination with the disposable cleaning sheet 44 which is releasably attached to the mop head 22 using the slitted attachment structures 42. The cleaning sheet can be provided in the form of a woven or non-woven fabric, as discussed more fully hereafter.

The mop head 22 preferably includes a base 46 to which a universal joint 30 is attached and an elastic pad 48 which is attached, preferably adhesively attached, to the base 46, wherein the leading edge 24 and the trailing edge 26 of the mop head 22 are formed as part of the elastic pad 48. The bottom surface 50 of the elastic pad 48 engages at least a portion, and, more preferably, a substantial portion of the cleaning sheet 44 during use, as shown in Fig. 4. In a preferred embodiment, the elastic pad 48 is formed from an ethylene-vinyl acetate copolymer ("EVA"). The elastic pad 48 can be formed using an injection molding process, a compression molding process, or other similar processes known in the art. Preferably, the elastic pad 48 is a compression-molded EVA pad. Non-limiting examples of suitable EVA resins to form the elastic pad 48 include those having a vinyl acetate content of from about 12% to about 25%. Suitable EVA resins are commercially available from Samsung General Chemicals under the trade name E180F and from DuPont under the trade name Elvax®. Surprisingly, it has been found that elastic pads formed of EVA tend to generate stronger electrostatic forces as compared to other materials, such as polyurethane. This benefit is especially noticeable when a mop comprising an EVA elastic pad is used in combination with a nonwoven cleaning sheet, especially a sheet comprising synthetic fibers or a hydroentangled sheet. The improvement in electrostatic forces helps the cleaning sheet to be even more effective in picking-up and retaining particulate matter from the surface being cleaned, such as dust, dirt, and the like.

It has been found that an elastic pad 48 having a contact surface 52 with a width 53 which is less than about 50 mm provides improved sheet cleaning performance and sheet usage efficiency (e.g., increased usage of the bottom surface of the sheet). Not intending to be bound by any theory, it is believed that the width 53 of the contact surface 52 provides a mop which can repeatedly "rock" or "pivot" or "rotate" about the contact surface 52 during any single continuous forward and/or backward sweeping motion of the mop 20, thereby providing increased dust and particulate collection and cleaning across a larger percentage of the surface area of the cleaning sheet 44 as

the bottom surface of the sheet repeatedly engages and disengages the hard surface to be cleaned due to the rocking motion. It is also believed that the pivoting about the contact surface 52 is further aided by a gap 54 at the leading and/or trailing edges 24 and 26 of the mop head 22 as well as the cross-sectional shape of the profile of the bottom surface, as discussed more fully hereafter. As used herein, the phrase "contact surface" is intended to refer the portion of the cross-sectional profile of the bottom surface of either the mop head 22 or the cleaning sheet/substrate 44 contacted by a straight line 56 tangent to the apex of that bottom surface, wherein the straight line 56 is substantially perpendicular to the transverse axis 58 of the mop head 22. While it is preferred that the cross-sectional profile of the bottom surface of the mop head or the cleaning sheet is the same along the entire longitudinal axis of the mop head or the cleaning sheet, any cross-sectional profile can be used herein to determine the contact surface. It will be understood that all measurements herein are based upon the theoretical or true shape and size of the mop head and/or cleaning sheet prior to deformation during use. As used herein, the term "apex" is intended to refer to that portion of the bottom surface of either the mop head 22 or the cleaning sheet 44 which is furthest from the top surface 60 of the mop head 22.

The preferred contact surface of the mop head is described in greater detail in the Applicants copending international patent application number US01/05830, the subject of which is incorporated herein by reference.

The width 53 of the contact surface 52 is preferably less than about 50 mm, and, more preferably, the width 53 of the contact surface 52 is between about 2 mm and about 50 mm. Most preferably, the width 53 of the contact surface 52 is between about 2 mm and about 20 mm. In addition to the size of the contact surface, the shape of the profile of the bottom surface 50 of the mop head 22 and/or the cleaning sheet 44 in combination with the previously described width 53 of the contact surface 52 influences whether a repeated rocking motion of the mop head is achieved during use. The profiles of the contact surface 52 are substantially curved (e.g., parabolic, hyperbolic, and other curved segments) and are preferably convex in shape, wherein the width 53 is a theoretical point contact or tangency 62 as previously discussed while for substantially straight contact surfaces the width 53 of the contact surface is between about 2 mm and about 50 mm.

The combination of the shape of the profile (e.g., substantially curved or substantially straight) of the contact surface 52 and the width 53 of the contact surface 52 are preferably combined with a gap 68 formed between the straight line 56 defining the contact surface 52 of either the bottom

surface of the mop head 22 or the bottom surface of the cleaning sheet 44 and the terminal point(s) 70 of the subject bottom surface. In other words, the term "gap" is intended to refer to the distance between the straight line 56 and the terminal point 70 of the bottom surface of either mop head 22 or the cleaning sheet 44. A sufficient gap can ensure that over a wide range of operating conditions (e.g., operating angle between the handle and mop head, mopping speed, force applied by the user, etc.), the mop head maintains the preferred rocking motion. Generally for both the mop head 22 and the cleaning sheet 44, the terminal points 70 are defined by the leading edge 24 or trailing edge 26, as shown in Fig. 4. Preferably, the gap 68 is at least about 1.5 mm and, more preferably, is between about 2 mm and about 10 mm. Most preferably, the gap 68 is between about 2 mm and about 5 mm. Thus, the gap, profile shape of the contact surface, and the width of the contact surface are interrelated to varying degrees and can be changed as taught herein in order to provide a mop having a mop head which repeatedly rocks when it is moved forward and/or backward during any single continuous forward or backward motion of the mop head, such rocking motion beneficially improving the cleaning performance of the cleaning sheet 44. The synergy between the gap 68 and curved profile of the bottom surface can be represented by the ratio of the radius of curvature 66 to the gap 68, wherein the ratio is preferably between about 0.5 and about 1000. More preferably, the ratio of the radius of curvature 66 to the gap 68 is between about 1 and about 600. Most preferably, the ratio of the radius of curvature 66 to the gap 68 is between about 350 and about 600.

While a mop head 22 having a bottom surface which is convexly curved is most preferred, it is contemplated that bottom surfaces having a stepped profile, such as that illustrated in Fig. 5, can also provide the desired rocking motion so long as the width 653 of the linear portion of the contact surface 652 defined by the straight line 56 is at least about 2 mm. Each step 73 preferably has a longitudinally extending planar portion 74 adjacent a wall 75. While it is preferred that a plurality of steps 73 are provided so that the cleaning sheet is adequately supported during use, it is contemplated that a single step 72 could also be utilized.

As discussed, the bottom surface of the mop head 22 can be provided with a profile shape, profile size, and gap which produce the desired repeated rocking motion of the mop head during use. However, the combination of the cleaning sheet and the bottom surface of the mop head 22 can also be adapted to provide the previously described rocking motion of the mop head 22. For example with reference to Fig. 6, a tiered structure 76 with a plurality of steps 73 can be used in combination with an elastic pad 748 having a substantially smooth planar bottom surface, wherein the tiered structure 76 is incorporated into or disposed adjacent to the cleaning sheet 44 to provide

a bottom surface of the cleaning sheet having the same size and/or profile characteristics as previously described for the bottom surfaces of the mop head 22. Alternatively, the cleaning sheet 44 could include an insert having a curved bottom surface which provides the bottom surface of the cleaning sheet with the previously described curved profile size and/or shape surface characteristics. Accordingly, it will be appreciated that the profile size, shape, and gap previously described with respect to the bottom surface of the mop head 22 are equally applicable to the bottom surface of a cleaning sheet.

While cleaning sheets having low calipers are particularly suitable for use with the cleaning implements of the present invention, it is contemplated that a cleaning sheet having a high caliper can also be used, wherein the high caliper allows compression of the cleaning sheet at the leading and trailing edges of the mop head (as opposed to merely conforming to the shape of the bottom surface of the mop head for cleaning sheet having a relatively low caliper). This compression allows creation of a gap for rocking of the mop head during use. The cooperation between the caliper of the cleaning sheet and the gap of the mop head 22 can be characterized by the ratio of the individual sheet caliper to the distance of the gap 68 of the mop head 22, as shown in Fig. 7. As used herein, the phrase "caliper" and its derivatives is intended to refer to the thickness of the cleaning sheet when measured according to ASTMD5729-95, wherein the presser foot pressure is 0.1 psig. Preferably the ratio of individual sheet caliper to the distance of the gap is between about 0.01 and about 0.65. More preferably, the ratio the of individual sheet caliper to the distance of the gap is between about 0.1 and about 0.6, and, most preferably, the ratio of the individual sheet caliper to the distance of the gap is between about 0.25 and about 0.6. For instances where a high caliper sheet is used with a mop head having a convexly curved bottom surface with a radius of curvature, the ratio of the radius of curvature to individual sheet caliper is preferably between about 0.01 and 1800, and, more preferably, is between about 1 and about 1400. Most preferably, the ratio of radius of curvature to individual sheet caliper is between about 200 and about 1000.

In accordance with another aspect of the present invention, a floor mop having a mop head dimensioned to receive cleaning sheets which are sized for both hand dusting and dusting with a floor mop will now be described. Cleaning sheets suitable for use with the floor mop 20 (such as those discussed more fully hereafter in Section III) are adapted to attract and retain various types of dust and other particulates. For instance, the cleaning sheets are particularly suited at attracting and retaining particles ranging in size from about 1 x 10^{-4} mm up to larger sized particulates which can be 2 mm and greater in height. As such, these cleaning sheets can be particularly

suited for dusting surfaces by hand in addition to use with a cleaning implement, such as the floor mop 20. In order to provide a user of a cleaning implement with the greatest flexibility of use, the mop head 22 of the floor mop 20 is preferably sized to effectively retain a cleaning sheet which can be used with both the floor mop 20 and for hand dusting.

Such a cleaning sheet preferably has length (i.e., its longest dimension) to width ratio of between about 0.4 and about 1 and a sheet caliper of at least about 0.6 mm so that the cleaning sheet can adequately trap particles in both hand dusting and floor mopping applications and so that there is adequate surface area and depth for gripping the sheet during hand dusting as well as floor cleaning with the floor mop 20. More preferably, the caliper of the cleaning sheet is between about 0.6 mm and about 5 mm and most preferably is between about 0.8 mm and about 3 mm. The cleaning sheet preferably also has a length of at least about 400 mm and more preferably the length is between about 400 mm and about 500 mm. Accordingly, the mop head 22 preferably has a length (i.e., the longest dimension of the mop head) to width (i.e., the shortest dimension of the mop head) ratio of between about 0.3 and about 1 so that the hand dusting cleaning sheet can also be adequately and effectively retained about the mop head 22. More preferably, the mop head 22 has a length of at least about 400 mm. The above-described preferred cleaning sheet and mop head dimensions can be combined with a mop head having various types of bottom surfaces, such as a substantially flat bottom surface or a mop head having the textures, sizes and shapes previously described herein.

The mop of the present invention may equally be used with a wet cleaning sheet/substrate. In this embodiment it is optimal to use substrates that have structures with three-dimensionality. The three-dimensional structure of the substrates have been found to provide improved hair pick-up relative to planar sheets, which in a wet surface environment is surprising. In a preferred embodiment, the user advantageously uses slight weaving motions in an up-and-down wiping pattern to maximize hair pick-up.

Optimum wetness of the premoistened substrate is from about 1 to about 5 grams of solution per gram of substrate. In the context of a floor cleaning premoistened substrate, the substrate can optionally include an absorbent core reservoir layer with a large capacity to absorb and retain fluid. Preferably, the absorbent reservoir layer has a fluid capacity of from about 5 to about 15 grams per gram of absorptive material. Pre-moistened substrates intended to be used for the cleaning of walls, exterior surfaces, etc. will have an absorbent capacity of from about 2 to about 10 grams of liquid per gram of dry fibrous substrate.

Since there is no rinsing step in the context of a general purpose pre-moistened substrate, it is essential that the non-volatile content be kept to a minimum to avoid film/streak residue from product. Also, it has been found that compositions consisting of primarily organic hydrophobic cleaning solvents can deliver an excellent end result along with good cleaning in the context of a general purpose pre-moistened substrate for reasons similar to those described in pre-moistened glass substrates. Buffers with molecular weights of less than about 150 g/mole can be used advantageously to improve cleaning without harming end result performance. Examples of preferred buffers include ammonia, methanol amine, ethanol amine, 2-amino-2-methyl-1-propanol, 2-dimethylamino-2-methyl-1-propanol, acetic acid, glycolic acid, and the like. Most preferred among these are ammonia, 2-dimethylamino-2-methyl-1-propanol, and acetic acid. When used, these buffers are present in from about 0.005% to about 0.5%, with the higher levels being more preferred for the more volatile chemicals. As in the case of glass substrates, it has been found that simple compositions using low levels of non-volatile surfactant with preferably high levels of the preferred organic cleaning solvent are sufficient to provide excellent cleaning and wetting performance even in the absence of the hydrophilic polymer. However, the addition of polymer can advantageously be used to provide other benefits such as anti-spotting, antifogging, and easier next-time cleaning.

These substrates are then preferably attached to a mop head with a handle according to the present invention. In such an execution the pre-moistened substrate is ideal for light cleaning and disinfecting. Since the amount of solution released from the substrate is much more limited than that delivered through conventional cleaning, very effective anti-microbial systems need to be used. In one such composition the general purpose and floor pre-moistened substrate can contain a solution comprising an effective level of detergent surfactant and citric acid at about 0.5 to about 5%. To boost the efficacy of such solution hydrogen peroxide or a source of hydrogen peroxide can be added at about 0.5% to about 3%. An alternative composition could use quaternary ammonium salts such as dioctyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, C_{12}, C_{14} and C_{16} dimethyl benzyl ammonium chlorides, at levels greater than about 0.05%. Such compounds have been found to often interfere with the benefits of the preferred polymers. While these solutions (e.g., those comprising sources of hydrogen peroxide, quaternary ammonium compounds and citric acid) deliver a high degree of anti-microbial efficacy they can leave a filmy surface because they are solids and need to be used at high levels.

Better end result performance is delivered by compositions containing primarily the organic cleaning solvents described above at from about 0.25% to about 10%, more preferably 0.5% to about 5% to provide cleaning and wetting, in combination with non-volatile buffers described above. Low levels of non-volatiles including hydrophilic polymer can advantageously be incorporated such that the total level of non-volatiles excluding perfume and antimicrobials, is from about 0% to about 0.08%, more preferably from 0% to about 0.055%, most preferably from about 0% to about 0.025%. In a preferred embodiment, the combination of surfactants, wetting polymers, buffers and hydrophobic organic cleaning solvents are chosen so as a provide a surface tension reduction from water (72 dynes/cm) of more than about 25 dynes/cm, more preferably more than 30 dynes/cm, most preferably more than 35 dynes/cm. Optionally, low levels of more effective anti-microbial ingredients such as bronopol, hexitidine sold by Angus chemical (211 Sanders Road, Northbrook, Illinois, USA), Kathon®, 2-((hydroxymethyl) (amino)ethanol, propylene glycol, sodium hydroxymethyl amino acetate, formaldehyde, and glutaraldehyde, quaternary ammonium salts such as dioctyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, C12,C14 and C16 dimethyl benzyl (Bardac® 2280 and Barquat® MB-80 sold by Lonza), dichloro-s-triazinetrione, trichloro-s-triazinetrione, and more preferably 1,2-benzisothiazolin-3-one sold by Avicia Chemicals, chlorhexidine diacetate sold by Aldrich-Sigma, sodium pyrithione and polyhexamethylene biguanide at about 0.001% to about 0.1%, more preferably from about 0.005% to about 0.05% are added for preserving and/or providing antimicrobial benefits.

An important benefit of the wet substrates of the present invention is the fact that judicious selection of the antimicrobial actives combined with the lack of a rinsing step as preferred in the present invention, and lack of a buffing step (consumers are in the habit of cleaning floors and countertops to a wet end result), allow for residual disinfectancy benefits. By residual disinfectancy, it is meant that the residual antimicrobial actives delivered by the wet substrate onto the hard surface at least about 99.9% cidal against bacteria and other microorganisms for a period of from about 8 to about 72 hours, more preferably from about 12 to about 48 hours, most preferably at least about 24 hours. While residual disinfectancy can be achieved using conventional approaches (i.e., spray product with a paper towel, sponge, rag, etc.), the premoistened substrate has the added convenience of delivering the cleaning and disinfectancy benefits in one package. The residual properties result from a combination of low vapor pressure and high cidal efficacy of the antimicrobial actives associated with the compositions of the present invention. Those skilled in the art will recognize that residual disinfectancy benefits, if present in the context of compositions comprising a very low level of surfactant, are even more

easily achieved in compositions wherein the level of surfactants is raised. Residual disinfectancy, in addition to excellent end result, can provide consumers with reassurance as to the effectiveness of the wet substrate. Such reassurance is most important for tasks such as cleaning of surfaces that are particularly susceptible to harboring germs, most particularly counter tops, stove tops, appliances, sinks, furniture, showers, glass and other fixtures that are near or inside the kitchen or bathroom(s).

Preferred antimicrobial actives for residual benefits as delivered from a wet substrate or a dry substrate that becomes wet as a result of contact with a wet composition during the cleaning process, include Kathon®, 2-((hydroxymethyl) (amino)ethanol, propylene glycol, sodium hydroxymethyl amino acetate, formaldehyde, and glutaraldehyde, quaternary ammonium salts such as dioctyl dimethyl ammonium chloride, octyl decyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, C_{12},C_{14} and C_{16} dimethyl benzyl (Bardac® 2280 and Barquat® MB-80 sold by Lonza), dichloro-s-triazinetrione, trichloro-s-triazinetrione, and more preferably tetrakis(hydroxymethyl) phosphonium sulphate (THPS), 1,2-benzisothiazolin-3-one sold by Avicia Chemicals, chlorhexidine diacetate sold by Aldrich-Sigma, sodium pyrithione and polyhexamethylene biguanide at about 0.001% to about 0.1%, more preferably from about 0.005% to about 0.05%. The specific antimirobial actives and combinations thereof are chosen so as to be effective against specific bacteria, as desired by the formulator. Preferably, the antimicrobial actives are chosen to be effective against gram-positive and gram-negative bacteria, enveloped and non-enveloped viruses, and molds that are commonly present in consumer homes, hotels, restaurants, commercial establishments and hospitals. Most preferably, the antimicrobials provide residual disinfectancy against Salmonella choleraesuis, Pseudomonas aeruginosa, Staphylococcus aureus and Escherichia coli, and combinations thereof. Wherever possible, the antimicrobial actives are chosen to have residual disinfectancy benefits against more than one bacterial organism, and more preferably against at least one gram-negative organism and at least one gram-positive organism.

The inventors have found that residual disinfectancy can also be achieved or enhanced using pH. Additionally, use of low levels of surfactants to reduce surface tension by more than about 25 dynes/cm, preferably more than about 30 dynes/cm, can advantageously be used in combination with pH effects in the context of a pre-moistened substrate. Thus, compositions at a pH 10.5 or greater or a pH of 3 or lower are found to deliver the desired residual efficacy. The preferred hydrophilic, substantive polymer can be used to improve residuality, particularly for voltaile actives such as acetic acid. The use of pH can also help lower the level of the above actives

needed to achieve residual. Preferred actives that are effective as a result of pH include lactic acid, glycolic acid, C_8,C_9,C_{10} fatty acids, sodium hydroxide, potassium hydroxide.

This approach, i.e., using a combination of hydrophobic organic solvent plus volatile buffer plus optionally low levels of non-volatile raw materials to deliver a superior end result, in combination with effective and low streaking antimicrobials, can be used in a variety of practical applications herein disclosed, including general purpose cleaners, glass cleaners, glass cleaner substrates, solutions used with disposable pads (either with or without mop implements).

Use of low levels of non-volatiles in the compositions of the invention presents a challenge for perfume incorporation. Some methods to improve solubility of perfume are disclosed below. However, in certain instances, particularly when hydrophobic perfumes are desired, perfume incorporation can be problematic. To circumvent this issue, the inventors have advantageously found that perfume delivery can be achieved by directly applying concentrated perfume to either the substrate (or pad). In this manner, virtually any perfume can be used. In order to minimize any residue negatives that can be caused by the concentrated perfume, the perfume is preferentially applied to the perimeter of the substrate or pad, or to areas that do not directly contact the surface to be treated. In another embodiment, perfume can also be added into the package containing the substrates. In similar fashion, use of low levels of non-volatile actives makes incorporation of effective suds suppressors into the aqueous composition more difficult. It has been found that suds suppressors can more easily, and more effectively be applied directly to the substrate to prevent suds control. It is found that this not only addresses a consumer perception of too much sudsing, but surprisingly also has shown an improved end result upon surface drying. Furthermore, it has been found that applying suds suppressor directly onto the substrates makes process a lot easier through better control of suds during manufacturing and packaging. Preferred suds suppressors are those that are effective at levels of no more than about 0.1 grams of suds suppressor per gram of substrate, more preferably at levels less than about 0.01 grams suds suppressor per gram of substrate, most preferably, less than about 0.005 grams suds suppressor per gram of substrate. The most preferred suds suppressor in this context is DC AF, manufactured by the Dow Corning company. The use of suds suppressors to improve surface appearance is particularly significant since these materials are effective at very low levels.

The present invention further encompasses articles of manufacture comprising the above-described hand dusting sheet (i.e. cleaning sheet) in association with a set of instructions, which can be combined with a package, carton, or other container. As used herein, the phrase "in

association with" means the set of instructions is either directly printed on the cleaning sheet itself or presented in a separate manner including, but not limited to, a brochure, print advertisement, electronic advertisement, and/or verbal communication, so as to communicate the set of instructions to a consumer of the article of manufacture. The set of instructions preferably comprises the instruction to use the hand dusting sheet for hand dusting and/or with a cleaning implement, such as a floor mop, having a handle and a mop head. The set of instructions can further comprise instructions to use the hand dusting cleaning sheet with a floor mop having a mop head configured as previously described herein. For example, the instruction can instruct using the cleaning sheet with a floor mop having a mop head with a convexly curved bottom surface. Other instructions can instruct a use to assemble sections of a handle of a floor mop to complete assembly of the floor mop. Other instructions can instruct a user to attach the cleaning sheet to the mop head, move the floor mop, and then remove the cleaning sheet from the mop head. The present invention also encompasses articles of manufacture comprising the above-described wet cleaning substrates in association with a set of instructions, which can be combined with a package, carton, or other container. The set of instructions can further comprise instructions to use the hand dusting cleaning sheet with a floor mop having a mop head configured as previously described herein. For example, the instruction can instruct a user to assemble sections of a handle of a mop to complete assembly of the floor mop. Other instructions can instruct a user to attach the wet cleaning substrate to the mop head, move the floor mop over the surface to be cleaned, and then remove the substrate from the mop head.

The mop head 22 and universal joint 26 are preferably formed from ABS type-polymers (e.g., terpolymer from acrylonitrile), polypropylene or other plastic material by injection molding. The elastic pad 48 is preferably formed from polyurethane by molding.

Claims

1. A mop, preferably suitable for use with a removable cleaning substrate, comprising a mop head (22) and a handle (32), said handle (32) comprises at least two interconnectable segments (34, 35, 36), the first segment comprising a tapered end which is suitable for engagement with the non-tapered end of a second segment, characterized in that the tapered end comprises a first (25) and second (27) section of tapering, said first section (25) comprising tapering of greater angle than said second section (27).

2. A mop according to claim 1 wherein the interior surface of the non-tapered end is shaped to correspond to the shape of the exterior tapered surface of the tapered end.

3. A mop according to any preceding claim wherein the force required to separate two segments is greater than 20 kgf.

4. A mop according to any preceding claim wherein the force required to separate two segments is greater than 60 kgf.

5. A mop according to any preceding claim wherein the first section (25) tapers at an angle of at least 2°.

6. A mop according to any preceding claim wherein the first section (25) tapers at an angle of from 2.0° to 20.0°

7. A mop according to any preceding claim wherein the second section (27) tapers at an angle of at least 0.5° but less than 5.0°.

8. A mop according to any preceding claim wherein the second section (27) tapers at an angle of from 0.5° to 3.0°.

9. A mop according to any preceding claim wherein the transition between the non-tapered area of the segment and the first section of tapering and/or the transition between the first and second sections of tapering is curved

10. A mop according to any preceding claim wherein the segments, once engaged, overlap by a length 0.5 to 5.0 times the diameter of the non-tapered end.

11. A mop according to any preceding claim wherein the segments, once engaged, overlap by a length 1.0 to 2.0 times the diameter of the non-tapered end.

12. A mop according to any preceding claim comprising at least 3, more preferably at least 4 segments.

13. A mop according to any preceding claim wherein the segment is hollow.

14. A mop according to any preceding claim wherein the shape of the cross section of the segments is selected from the group consisting of circular, oval, curvilinear, star, flower, polygonal, shapes wherein at least one edge is flat or substantially flat and mixtures thereof.

15. A mop according to any preceding claim wherein one of the segments comprises a hand grip, preferably an elastic, resilient hand grip.

16. A mop according to any preceding claim wherein one segment comprises (i) a tapered or non-tapered end and (ii) a threadedly interconnectable end, being either a threaded end or an end capable of receiving a threaded end.

17. A mop according to any preceding claim wherein the mop comprises a segment which is interconnectable with the mop head via a pivotable universal joint (30).

18. A mop according to any preceding claim wherein the segments are made from metal, more preferably aluminium or steel.

19. A mop according to any preceding claim comprising a mop head comprising at least one attachment structure (42) configured to receive and retain a cleaning substrate (44), preferably the mop comprises a plurality of attachment structures.

20. A mop according to any preceding claim comprising a substrate (44) attached to the mop.

21. A mop according to claim 20 wherein the substrate is loaded with a cleaning lotion.

22. A mop according to any preceding claim wherein the segments once engaged are locked in place using an additional locking system.

23. A process of assembling a mop according to any preceding claim by engaging a tapered end of a segment into a non-tapered end of another segment until all segments are interconnected,

24. A process according to claim 23, wherein the segments when engaged are then pushed together.

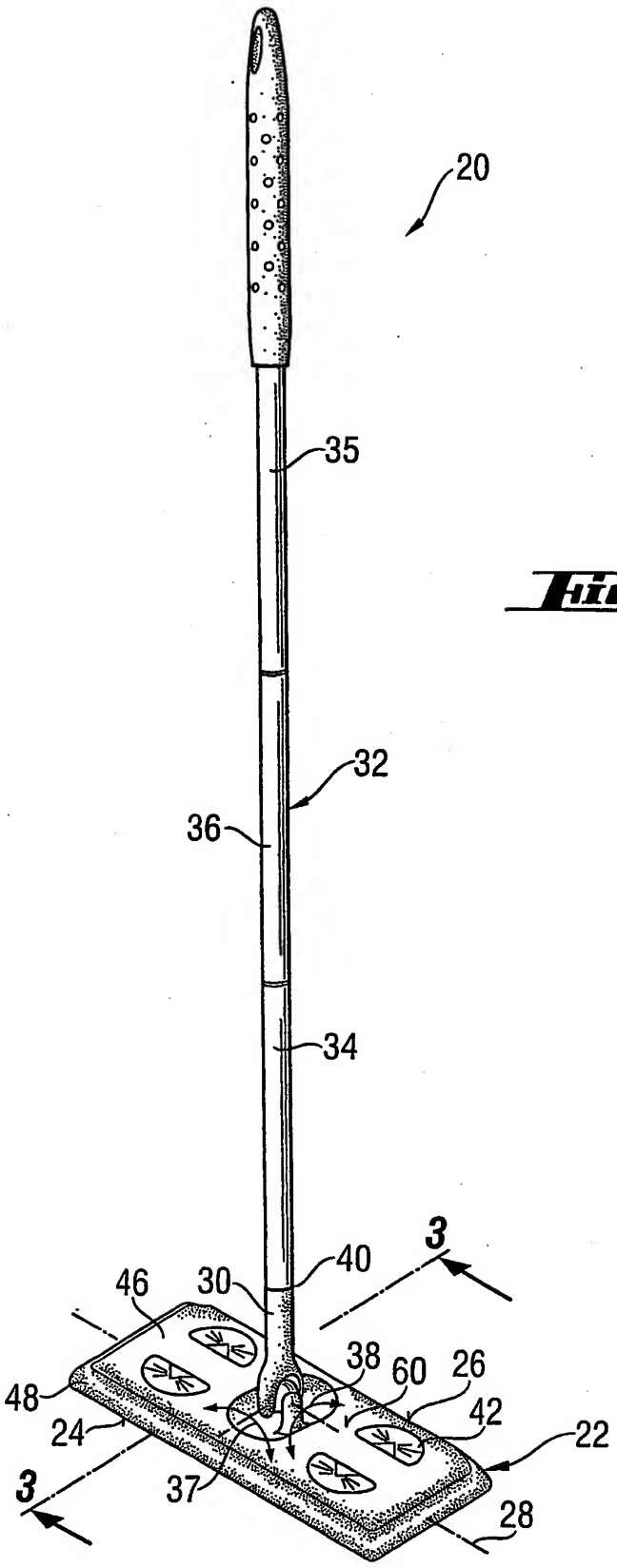


Fig. 1

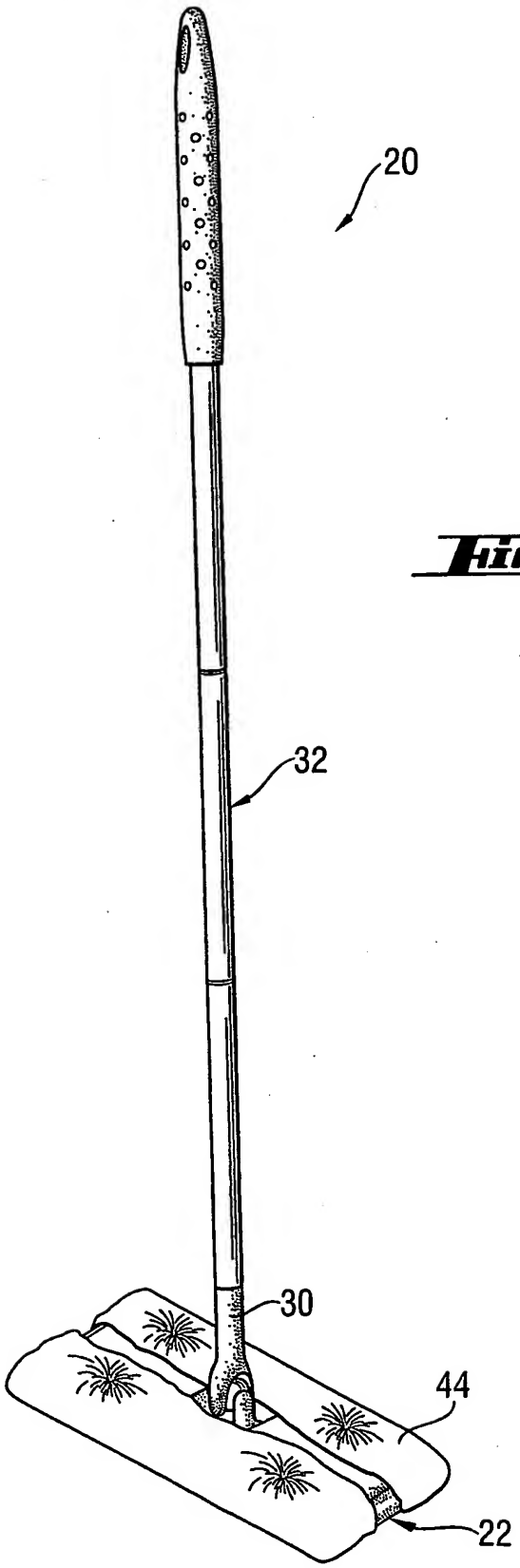


Fig. 2

Fig. 3

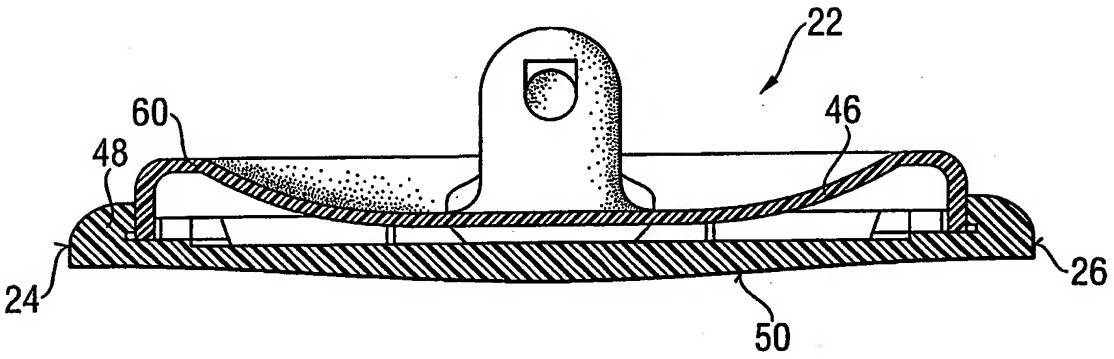
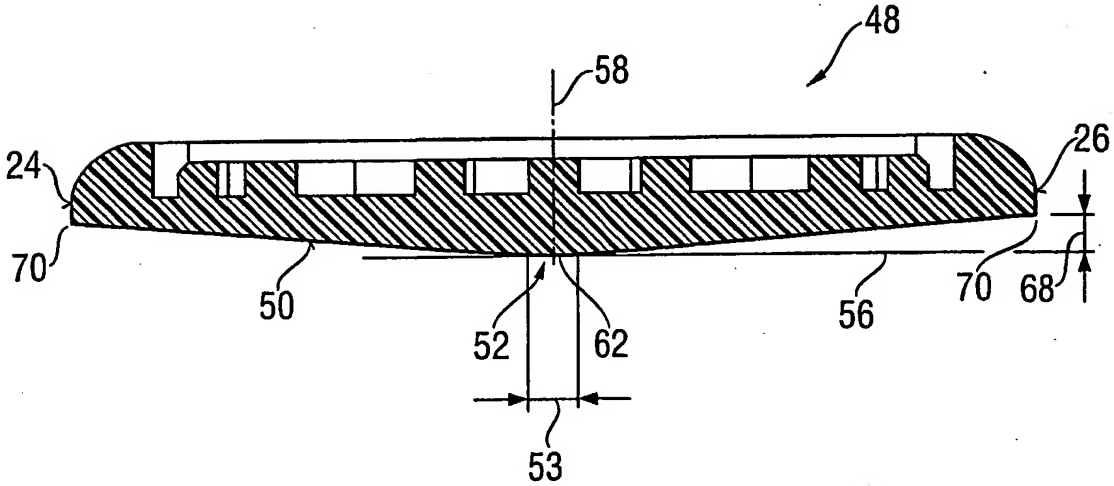


Fig. 4



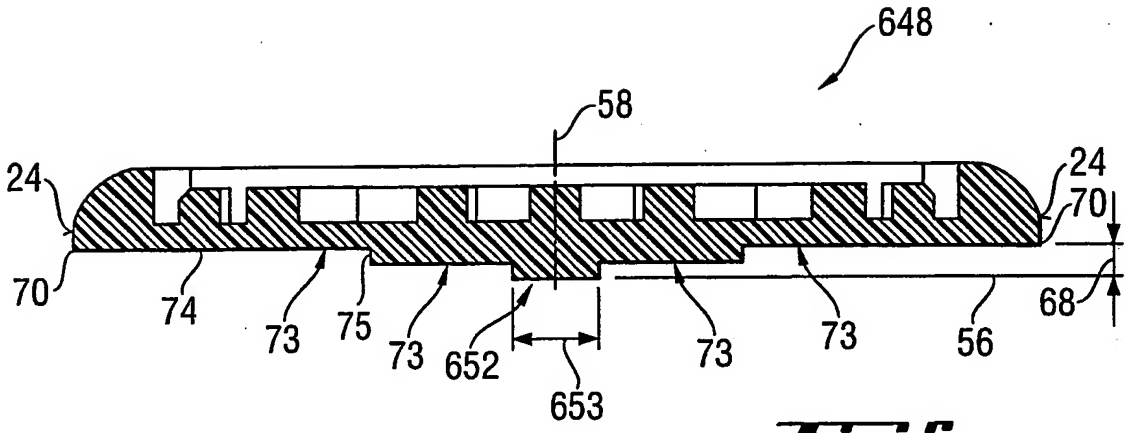


Fig. 5

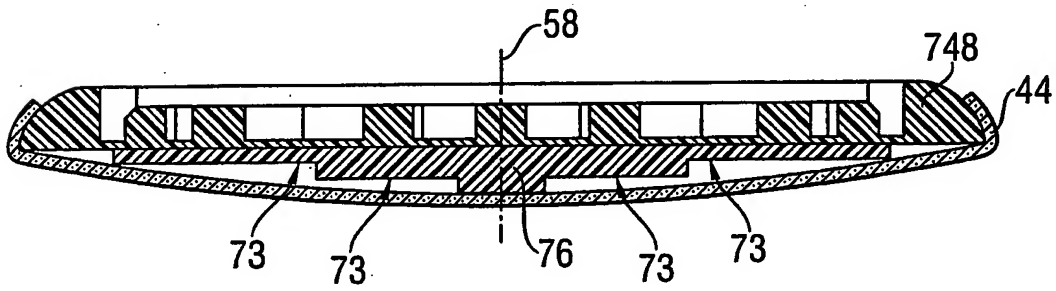


Fig. 6

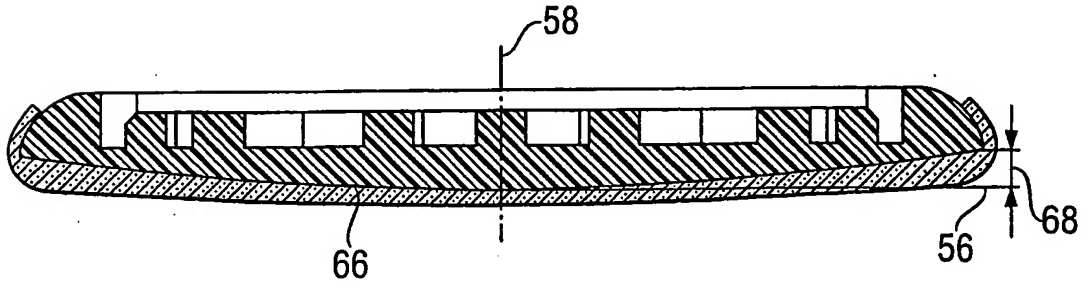


Fig. 7

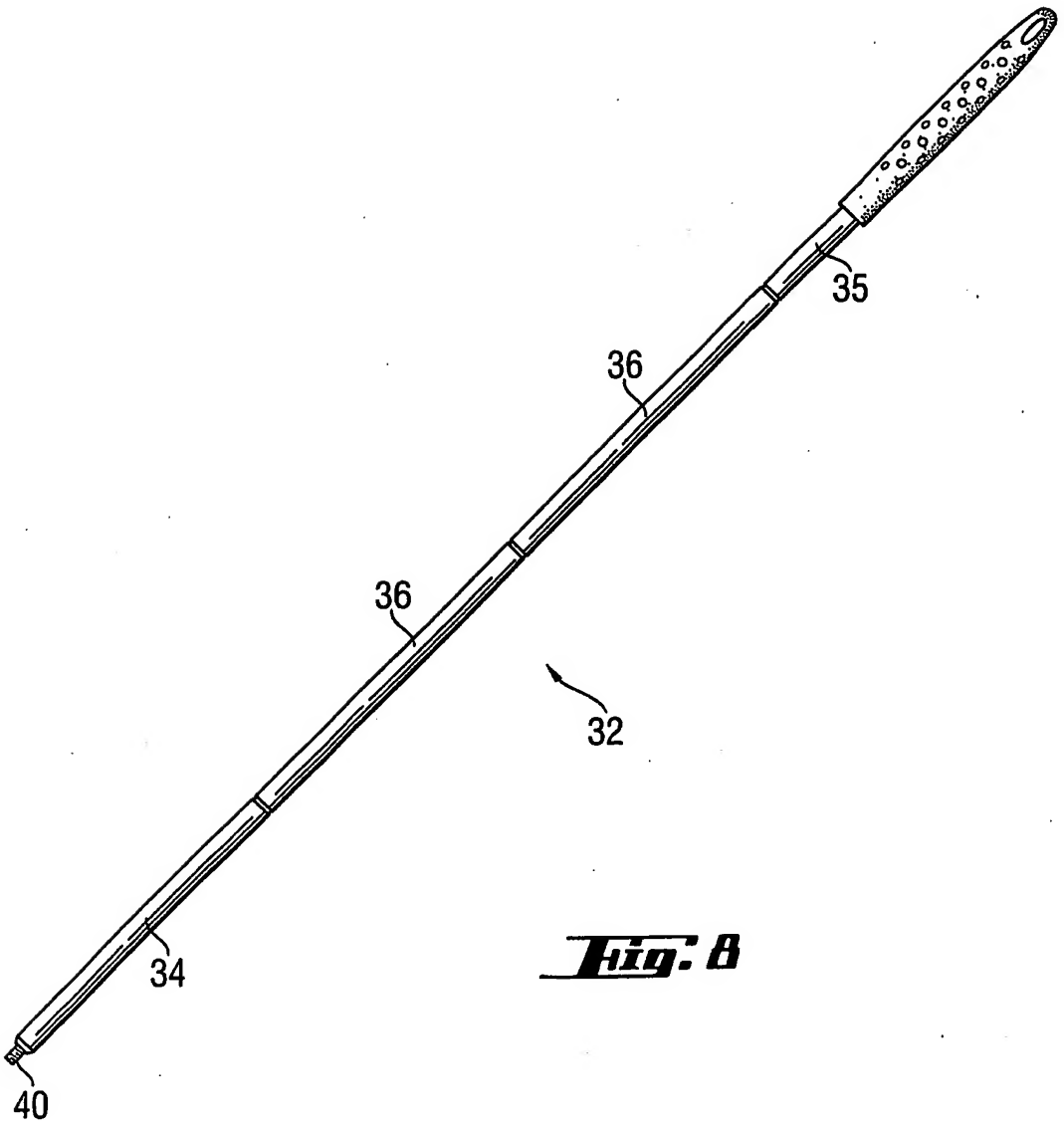


Fig. 8

Fig. 9

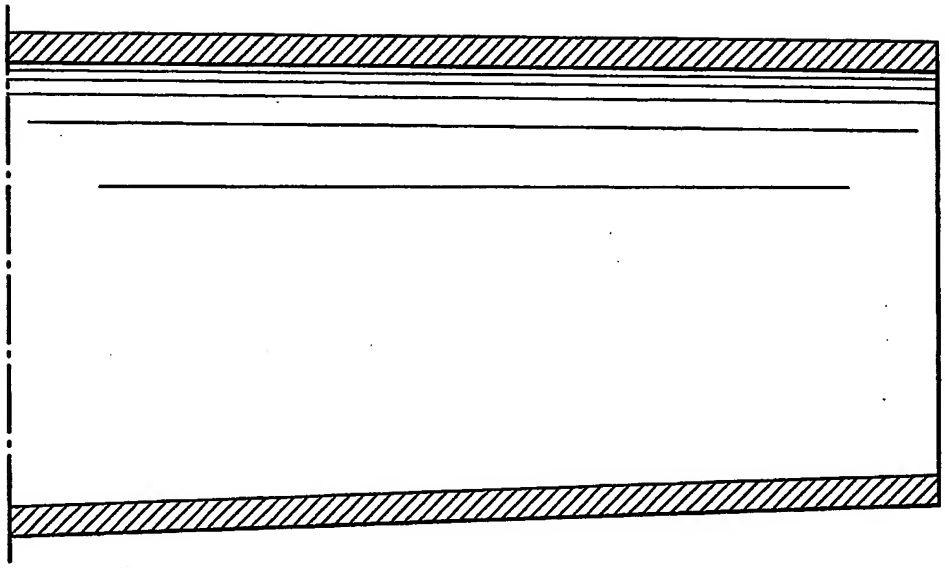


Fig. 10

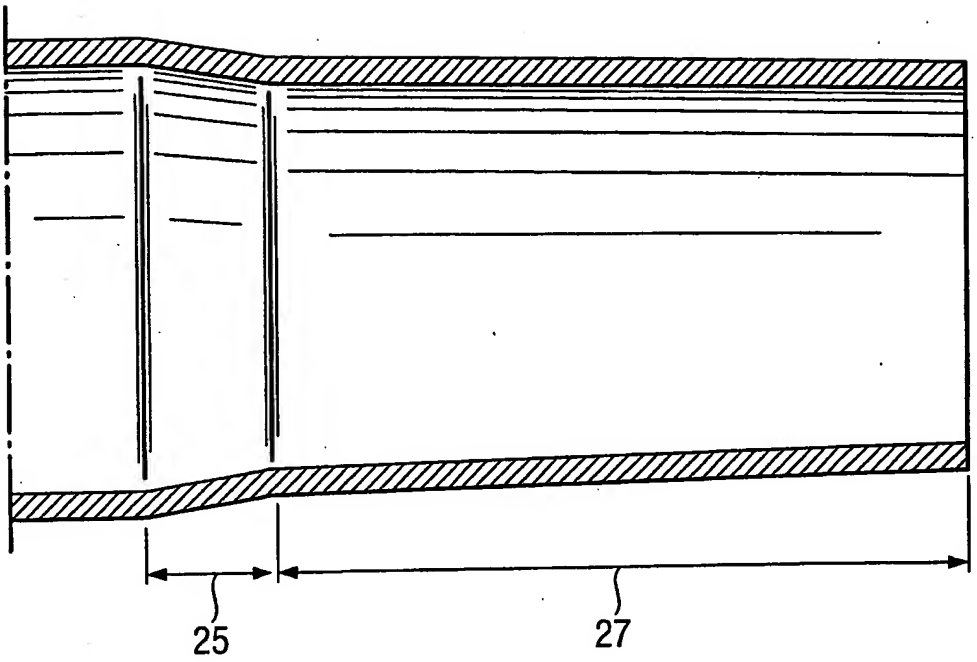
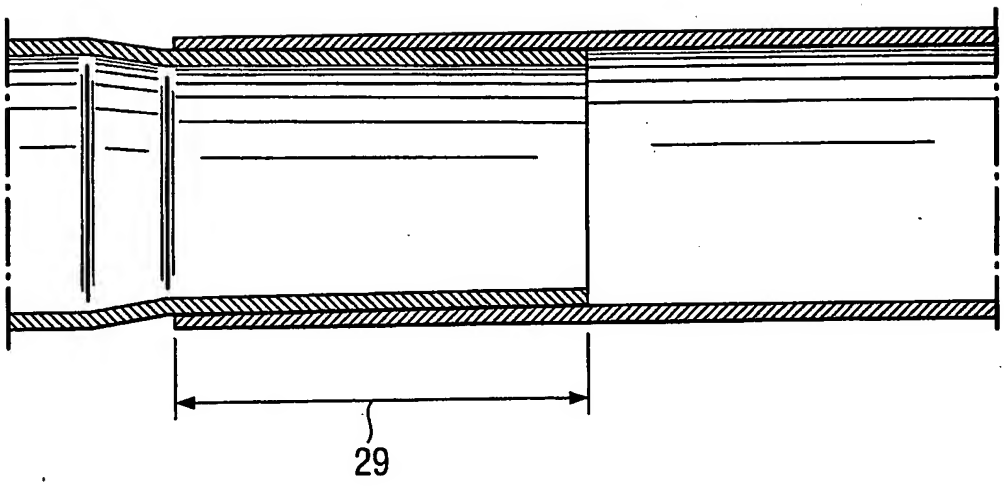


Fig. 11



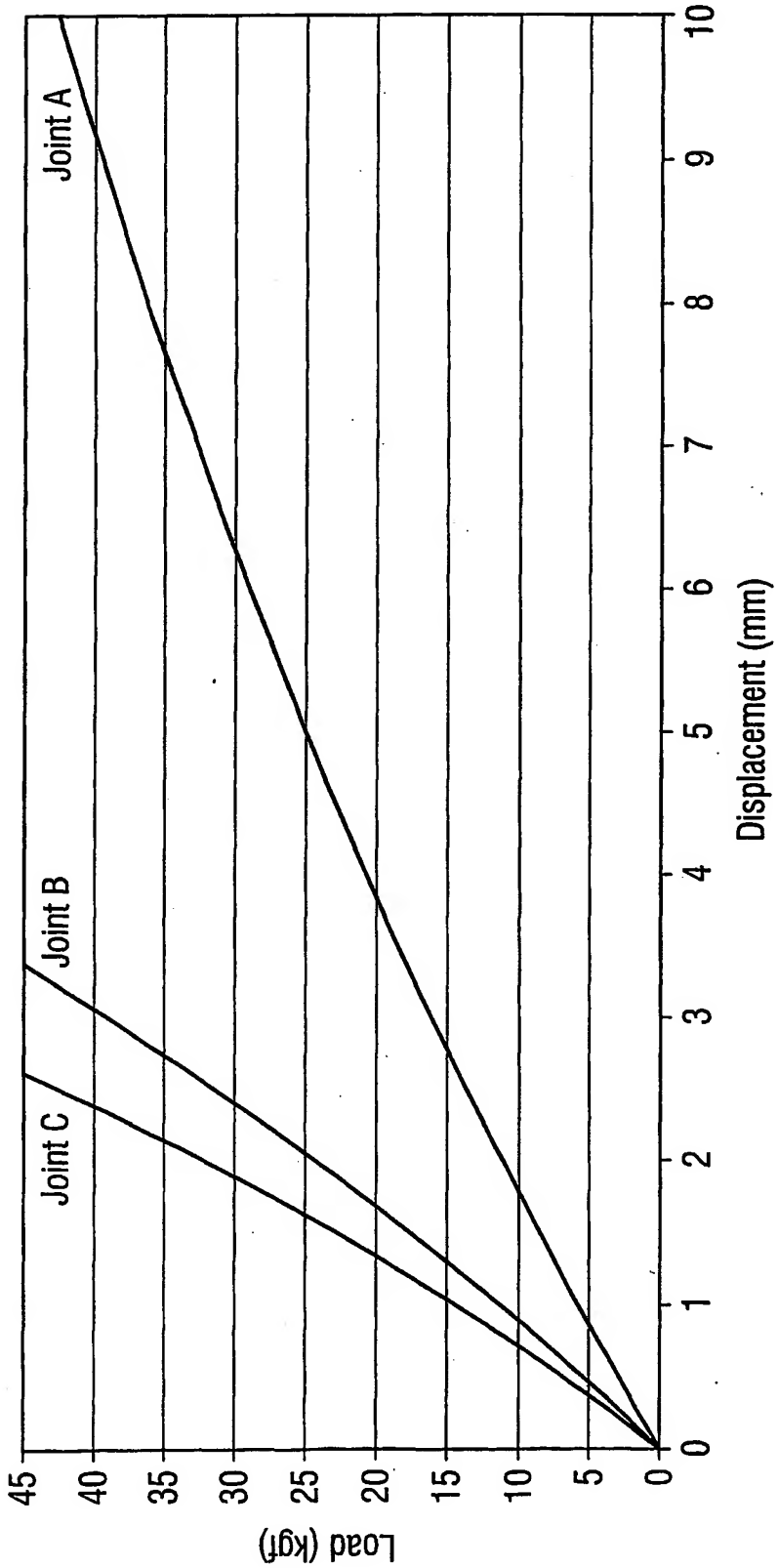

SWEEPER BENDING PROFILES
(2nd order fit curves with zero intercept)
Joint A
Joint B
Joint C
Load (kgf)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
0
1
2
3
4
5
6
7
8
9
10

Fig. 12

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/29555

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A47L13/20 A47L13/42 B25G1/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A47L B25G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
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Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	WO 99 11171 A (BRYNGELSSON PETER ;PRO GRUPPEN AB (SE)) 11 March 1999 (1999-03-11) page 2, line 5 -page 3, line 22	17

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 November 2002	26/11/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Martin Gonzalez, G

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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